REMARKS

Claims 1-5, 8-14, and 16-18 are pending. Claims 6, 7, and 15 are canceled.

Rejections Under 35 U.S.C. §103

Claims 1, 4-5, 8-14, and 16-18 are rejected under 35 U.S.C. §103(a) as being unpatentable over Creutz et al., U.S. Patent No. 4,110,176, in view of Liu et al., U.S. Patent No. 6,004,880 and Rodbell et al., U.S. Patent No. 6,344,129. Claims 2 and 3 are rejected under 35 U.S.C. §103(a) as being unpatentable over Creutz et al. in view of Liu et al. and Rodbell et al. as applied to Claim 1, and further in view of Carl et al., U,S, Patent No. 6,436,267. Applicant respectfully disagrees and traverses the rejections of Claims 1-5, 8-14, and 16-18.

Creutz et al. teach the use of a solution having an additive, which becomes adsorbed on the conductive surface of a substrate, but, as noted by the Examiner, Creutz et al. do not teach or suggest (1) electroplating on a substrate that includes a conductive surface with a top portion and a cavity portion, (2) applying an external influence to the top portion, the external influence removing a portion of the additive adsorbed on the top portion, or (3) maintaining a low temperature processing environment. As noted by the Examiner, Liu et al. teach "the concept of electroplating on a microelectronic substrate that included top portions and cavity portions and applying an external influence through polishing pad 104 which contacted the top portion of the conductive surface to form a planar electrodeposited layer." Also as noted by the Examiner, Rodbell et al. teach "electroplating of copper on a microelectronic substrate that included top portions and cavity portions at reduced temperatures (0-18°C) for the purpose of decreasing dopant levels in the electroplated copper layer."

The Examiner contends that "it would have been obvious to one of ordinary skill in the art (1) to have applied the electroplating method of Creutz et al. to a substrate that included a conductive surface that included both a top portion and a cavity portion because Liu et al. and Rodbell et al. teach the desirability of using copper electroplating to make microelectronic devices; (2) to have used the device/method of Liu et al. to have applied an external influence using the polishing pad 104 to the substrate because Liu et al. teach (see col. 5, line 51 to col. 6,

line 13) that the polishing pad was able to provide effective planarization of the electrodeposited layer simultaneously to the electroplating step, thereby decreasing the number of processing steps required; and (3) to have maintained the electroplating environment at a low temperature as suggested by Rodbell et al. for the purpose of decreasing dopant levels in the electroplated copper layer."

The skilled artisan would not have been motivated to combine the cited references. The Examiner contends that the polishing pad of Liu et al. would have been expected to have performed the function of removing a part of the additives to create a planar layer "since it swept the conductive surface." Even if the Liu et al. polishing pad would have removed part of the additives, the combination would still not meet the claims since Liu et al. do not teach or suggest processing the conductive top surface of the workpiece before the additive re-adsorbs onto the top portion. Neither the Creutz et al. reference nor Rodbell et al. reference teaches or suggests processing the conductive top surface of the workpiece before the additive re-adsorbs onto the top portion.

There would have been no motivation to modify the Liu et al. apparatus with a low temperature environment. The Examiner argues that Rodbell et al. provided the motivation for modifying Liu et al. -- for the purpose of decreasing dopant levels in the electroplated copper layer. However, the skilled artisan would have had no motivation to use a low temperature process with the Liu et al. process and the Creutz et al. solution. As noted by the Federal Circuit, "[b]oth the suggestion [to combine] and the expectation of success, must be founded in the prior art, not in the applicant's disclosures." In re Dow Chemical Co., 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988). The Examiner is simply combining Rodbell et al.'s low temperature process for chilling the Rodbell et al. additives with the adsorbed additives of the Creutz et al. solution and the Liu et al. polishing pad, but the Examiner has not pointed to any indication in Rodbell et al. (or any of the cited references) of a reasonable expectation of success from chilling the Creutz et al. solution containing the Creutz et al. additives, which is different from the Rodbell et al. solution.

Thus, none of the cited references provides any motivation for combining the Creutz et al. solution and the teaching by Liu et al. of applying a polishing pad while electroplating a substrate that having top portions and cavity portions, with Rodbell et al.'s low temperature process.

Claims 1 and 11 are therefore patentable over Creutz et al., Liu et al., and Rodbell et al., either alone or in combination. Claims 4, 5, 10, 12-14, 17, and 18, which depend from and include all of the limitations of Claim 1 or Claim 11, are also patentable. Furthermore, each of the dependent claims recites additional features of particular utility.

As discussed above, Claims 1 and 11 are patentable as there is no motivation or suggestion to combine the Creutz et al., Liu et al., and Rodbell et al. Carl et al. disclose an electrochemical deposition process using an electrolyte, but Carl et al. do not teach or suggest using additives or using an external influence to contact the surface. Furthermore, Carl et al. merely mention that temperature controls may be provided adjacent the substrate support "to maintain substrate temperature at a desired temperature during processing." As discussed above, there is no suggestion in Carl et al. of additives in the electrolyte nor sweeping the conductive surface. Thus, there cannot be any suggestion in Carl et al. of using a low temperature environment or chilled electrolyte while contacting the conductive surface with an external influence.

Claims 1 and 11 are therefore patentable as they are not obvious in view of Creutz et al., Liu et al., Rodbell et al, and Carl et al., either alone or in combination. Claims 2 and 3, which depend from and include all of the limitations of Claim 1, are therefore also patentable. Furthermore, each of the dependent claims recites further distinguishing features of particular utility.

Double Patenting

Claims 1-18 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over Claims 1-30 of U.S. Patent No. 6,534,116 in view of Rodbell et al. Applicant respectfully notes that only Claims 1-5, 8-14, and 16-18 are currently pending, and respectfully disagrees that Claims 1-5, 8-14, and 16-18 are unpatentable over Claims 1-30 of the '116 patent.

As discussed above, Rodbell et al. teach to use a low temperature environment in order to lower the dopant levels in a plated copper film and that the lower dopant levels contribute to a fast resistivity transient and allow "both adequate fill and low resistance films to be simultaneously achieved." Rodbell et al., at Col. 6, lines 6-14; *see* also Rodbell et al., at Col. 5,

lines 46-49. Rodbell et al. merely teach using low temperature and a solution with a lower additive concentration, but, as discussed above, there is no indication in the art of a reasonable expectation of success if the additives of the '116 patent will work when chilled. Thus, Applicant respectfully submits that there is no motivation to combine the claims of the '116 patent with Rodbell et al. and respectfully traverses this double patenting rejection.

Conclusion

Applicant respectfully submits that all of the pending claims are patentably distinguishable over the prior art of record. The cited references, either alone or in combination, do not teach or suggest Applicant's claimed invention.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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